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RISK OF GLOBAL ECONOMIC CRISIS IN 2022 AND THE MECHANISM OF TRANSMISSION OF ECONOMIC SHOCKS BETWEEN THE MAIN AREAS OF THE GLOBAL ECONOMY

| Abstract

- ▶ *Goal* – the aim of the study is to analyze the main economic areas of the global economy in terms of the possibility of transferring the crisis in relation to the current global economic situation.
- ▶ *Research methodology* – the analysis conducted was based on literature research; the empirical analysis used causation in the Granger sense and Pearson's linear correlation coefficient.
- ▶ *Score/results* – The existence of the so-called "locomotive effect" was observed for a group of countries: USA–CSSA, CSSA–USA, EA–LA, EA–CSSA, LA–EA, CSSA–EA, MECA–LA, MECA–CSSA, LA–MECA, CSSA–MECA, EDA–CSSA, CSSA–EDA, LA–CSSA, CSSA–LA, meaning a positive domestic shock transmitted to the economic partner, among the countries studied, the analysis is carried out based on annual data of GDP values as a measure of economic activity. CSSA remains the safest economic area and also the most neutral in view of the current global economic and political situation. In the WPE, there is a maximum [full] correlation of 1 for: EDA–USA, MECA–EA, EDA–EA, MECA–EDA and EDA–MECA. These are currently the most dangerous and crisis-prone areas, with potential for transferring crises between them. It is facilitated by territorial cohesion and the geopolitical situation between countries in these economic regions. Relatively high correlations can also be observed in these areas between the analyzed factors: IMP, IMG, IDCF and PC. The risk of transferring a crisis resulting from war between the areas mentioned is the highest here. Other correlations in terms of: USA–EA, USA–LA, EA–USA, LA–USA, LA–EDA,

EDA–LA remain at weak or average levels. This is influenced by geographic distance and the lack of strong economic and political ties.

- ▶ *Originality/value* – the originality of the study results from the topic undertaken. Identification of potential crisis areas and channels of crisis transmission in the current global geopolitical situation constitutes an added value.

| **Keywords:** crisis, economic situation, locomotive effect, shock, transmission channel.

1. Introduction

The current picture of the onset of the global economic and financial crisis at the moment, as a consequence of the COVID-19 pandemic and the war in Ukraine, manifests itself in a deceleration of economic growth. This includes a rise in unemployment (so far outside Poland), a decline in the rate of investment growth, as well as a decline in consumer spending. The rise in the price of currencies that have been devaluating has also become apparent, which is beginning to reduce imports and exports. As a result, unfavorable liquidity in some industries can already be identified. This will result in employment reduction and redundancies. Some companies may go bankrupt in the future, through these factors. Domestic banks have solid balance sheets, and some have already stopped lending money to each other. They are reluctant to lend, and if they do, they are very careful. Companies with fewer resources are cutting back on hiring, or the hours of work performed. The difficulties of European companies are affecting foreign contractors. Besides, “bombarded” with catastrophic news from the world, people have started to be more careful with their money and will curb their shopping appetites. Inflation levels continue to remain high, with a tendency to rise further. Adding to the total predicament facing much of the global economy, there is an energy crisis caused by the sanctions imposed on Russia as a result of the war in Ukraine, and the disrupted commodity supply chains resulting from the COVID-19 pandemic and the aforementioned war. All of these developments are ultimately compounded by the attempt by Russia and its coalition partners to change the existing world order in the balance of economic, political, and security power.

The distinctions made in the literature between continuous and transitory, domestic, global, symmetric and asymmetric shocks are the result of theoretical studies of international business cycles and international political coordination.

The strength and direction of their impact in different parts of the global economy is still largely a subject of theoretical considerations that lack empirical confirmation.

The aim of the study is to analyze the main economic areas of the global economy in terms of the possibility of transferring the crisis in relation to the current global economic situation. The realization of the goal was based on the discussion of: the issue of transmission of the crisis in economic theory, the economic and political background of the coming crisis, and the practical aspects of the transmission of economic shocks in the context of the coming crisis.

2. The issue of crisis transmission in literature

Crises have accompanied the development of economies for centuries, but recent years have seen an increase in their frequency as well as their depth. In addition, it can be observed that economic downturns occur in different countries at the same time, even when countries are far apart. Because of that, in order to explain this phenomenon in the literature, concepts have emerged stating that the crisis can be transmitted from one country to another. This process can be referred to as *contagion*. Many authors use the two terms interchangeably. However, they can be distinguished from a theoretical point of view.

Namely, according to the World Bank, there are three different approaches to defining them [World Bank, 2022]:

- the broad one: contagion means the transmission of a shock from one country to other areas, demonstrating international character; it is worth noting that this transmission involves both positive and negative impulses;
- the narrow one: contagion is the transmission of shocks from a contagious country to other areas, but the relationship between entities goes beyond fundamental links; this view includes the case where several contagious countries share the same source of shock; similar changes in the performance of individual economies can be explained by herd behavior;
- the very narrow one: contagion can be observed between countries if the correlation between their economies increases during the crisis period compared to the traditional period of development.

Contagion can also be defined as the spread of market distortions across several countries, which manifests itself in similar changes in exchange rates,

stock market asset prices, capital inflows and domestic bond premiums. However, one can distinguish between real *contagion* and “pure” *contagion*. Real contagion is characterized by the spread of crises, which can be explained by trade and financial ties between certain countries. “Pure” contagion, on the other hand, cannot be explained by fundamental linkages alone, as it is also influenced by the behavior of investors and financial agents [Dornbusch, Parks, Claessens, 2000: 4].

Three factors can be used to distinguish the contagion effect from traditional transmission [Mazurek, 2011: 21; Antczak, 2000]:

- the nature of the links between economies that allow the crisis to spread;
- the rate at which negative economic impulses are transmitted;
- the scale of the phenomenon, that is, the number of countries that have been infected by the crises.

As already mentioned, for the transmission of negative business cycle impulses, economies must be characterized by fundamental linkages, which include those of a trade and financial nature. The contagion effect, on the other hand, can be described in two ways. Firstly, in the case of the spread of economic impulses that cannot be explained by fundamental linkages, while secondly, it is possible to identify the area through which contagion occurs, such as the global financial market, investor behavior or speculative attacks. With different channels for the spread of crises, this also entails different transmission rates of these negative impulses. Given that a reduction in exports leads to a reduction in production, and consequently a decrease in employment and investment, it is reasonable to assume that the full sequence of events will take time. Considering the development of technology used in financial market transactions, it can be noticed that the contagion effect is occurring rapidly. The last factor that distinguishes the two terms is the scale of the phenomenon, which is dictated by the previous considerations. Since economies must be characterized by fundamental ties in order for crisis transmission to occur, the scope of the phenomenon will be limited to the number of countries that cooperate with each other. In the case of the contagion effect, the range will be much greater due to the multiplicity of channels for the transmission of negative conjunctural impulses [Mazurek, 2011: 21–23]. Concepts of the vulnerability of economies to shocks are also linked to theories on the spread of crises. One representative of this approach is P. Guillaumont, who believes that the vulnerability of an economy to shocks is nothing more than the risk that a country will be affected by unforeseen shocks. Factors that

have a particular impact on this type of risk are the magnitude and likelihood of shocks, the exposure of an economy to shocks, and the country's ability to respond to shocks. The first should be interpreted as a typically exogenous stimulus. Exposure to shocks, on the other hand, is more complex, as on the one hand it is dictated by the size of a given economy or population, which should be counted among a country's structural features, while on the other hand the process of opening up to international exchange is driven by political decisions. The last factor, country's ability to respond to shocks, depends on the health of a given economy and its flexibility, which determines the depth of an economic downturn [Guillaumont, 2004: 57–61]. Other authors can be seen separating aspects of the economy's vulnerability to shocks and its resilience to shocks. As for the economy's vulnerability to shocks, it is dictated by structural conditions, and can only partly be shaped by policymakers. L. Briguglio believes that different factors determine a country's vulnerability to shocks. These can include economic openness, export concentration and dependence on imports of strategic products. Studies show that small countries have high vulnerability to shocks in particular. This is due to their relatively small resources, which makes the propensity to undertake trade among small countries greater than that of large countries. As a result, small countries are more vulnerable to economic shocks. Similarly, they are often characterized by a higher ratio of exports and imports to gross domestic product. The lack of strategic products leads to "exposure" to the foreign environment (e.g. changes in the price of strategic products). However, the fact that an economy is infected by a shock is significantly influenced by its resilience to shocks [Błaszkiwicz, Paczyński, 2001: 145; Chang, Velasco, 2001; Cutler et al., 2000].

It should be considered in terms of three aspects [Briguglio et al., 2004: 229–247]:

1. The economy is flexible enough to recover at a rapid pace from the pre-shock state despite the negative impact of the crisis.
2. The economy is able to absorb the effect of the shock, i.e. there will be an absorption of negative impulses, which will result in the end effect being neutral or barely felt.
3. The economy is able to avoid paralysis, which is equivalent to the opposite of vulnerability.

Kindleberger [Kindleberger, 1999: 210–211] lists the following issuing channels of the crisis: the commodity market, the movement of money, changes in

interest rates, the cooperation of monetary authorities and purely psychological links. It can also be noted that the decisions made by those in power when a country is infected by a shock can compound its effects or minimize them. Hence, the right decisions during a downturn can have an impact on the ultimate effect of the shock.

3. Political and economic background of the coming crisis

There is no doubt that we are now facing an emerging new global economic crisis that will shatter the existing world order and disintegrate the global economy, probably for a long period. The unfolding economic crisis is the result of the war in Ukraine, the progressive, planned dismantling of the modern global economic order, and the effects of the COVID-19 pandemic. While a pandemic is something natural, the Russian Federation, a state that was the political, cultural and military foundation of the Soviet Union and whose elites, after the temporary shock of the superpower's collapse, wanted to rebuild the empire with the significant approval of a huge part of the population that never got rid of the *homo sovieticus* mentality, is responsible for the war in Ukraine and the dismantling of the current world order. According to J. Chai "the problem, however, is far more serious, and the roots are still to be found in the traditions of Russian self-rule, authoritarianism, aversion to foreigners, Russia's political and strategic culture. Western-affiliated and especially NATO aspiring Ukraine appeared to Russia as the biggest obstacle on this path to empire restitution" [Czaja, 2015: 41]. Therefore, the actual process of dismantling the current world order was initiated by Russia's policy toward Ukraine, and the Georgian conflict was its rather clear foreshadowing. Russia has also shaken up European and Euro-Atlantic security. It has done so in a world characterized by interdependence, the flow of various phenomena across borders in a process that is referred to as globalization.

All of Russia's currently observed actions are embedded in the so-called Putin Doctrine. It could be described as a willingness to interfere in any area of the near foreign areas, under the pretext of protecting the population of Russian origin and even the Russian-speaking population. The evolution of this doctrine is moving in the direction of recognizing an attack on the Russian-speaking population as an attack on Russia. The most recent document, the Military Doctrine of the Russian Federation, signed by Putin on December 26, 2014,

includes a provision stating that it is no longer only possible to intervene in neighboring countries in defense of its own citizens, but even if the authorities of a neighboring country were to pursue policies contrary to Russia's interests [ibidem, 32]. The authors of the Doctrine, constructed in this way, assumed a "hidden agenda" in it, the effect of which is the current situation in the world, leading to a division in decision-making among countries in response to sanctions imposed on Russia. V. Putin correctly assumed that the likely sanctions imposed on Russia for its attack on Ukraine would divide the world, especially the Western world. Since the introduction of the Doctrine, Russia has spent 8 years preparing for its implementation, including making Western countries fully dependent on energy resources as a bargaining power in its sanctions policy against Russia. As a result, Germany, Hungary and Bulgaria, among others, strongly opposed the imposition of sanctions on Russia after it invaded Ukraine, fearing that Russia would cut off their access to energy sources. Thus, they contributed to the breakdown of unity in the coalition against Russia. It should also be remembered that many countries have adopted a neutral stance towards the war in Ukraine. Regardless of the stance taken toward Russia, the continuity of energy supplies is at risk in many countries ahead of the upcoming autumn-winter season.

Currently, the anti-Russian stance is definitely represented mostly by the European Union countries, the United States, Australia, Canada, the United Kingdom, Norway and Japan. Other countries around the world declare neutrality or support for Russia. And V. Putin seeks coalition partners for himself among such countries, reinforcing cooperation with China, Iran, Brazil, North Korea, Venezuela, Turkey, Kyrgyzstan, Tajikistan, Turkmenistan, Belarus, the ultra-separatist part of the Chechen Republic, Abkhazia, Serbia and Uzbekistan. These countries are fully pro-Russian as of today. Such a wide geographic distribution of Russia's potential allies could lead to numerous trade wars in the near future, as well as numerous disruptions and blockages in the supply chains of strategic raw materials, goods and services. Thus, Russia's ultimate goal is increasingly crystallized – the economic dismantling of the Western countries and, consequently, of NATO (after all, in the wake of commercial political action comes a new international security doctrine), and the creation of a new political, economic and military order in the world, with a clear hegemon: Russia. Russia has already achieved the non-military goal of blocking grain shipments from Ukraine, the world's largest granary by far. Russia sees an opportunity to change the optics of thinking among Western political elites in prolonging the armed

conflict with Ukraine (held hostage by Russia to its global interests), as a result of the European society being “exhausted” by war. Increasingly, anti-Russian politicians are beginning to fear that the European public will say “enough is enough”. That “we don’t want these sanctions to continue, because we are not ready to become poorer, to pay more for everything”. Hence, the Kremlin wants the European public to be “tired” of the war. Any political concessions to Russia could turn out to be “suicidal”, and would spell the end of Europe as we have known it for more than 200 years.

The global economy is facing turbulence as a consequence of foregoing events. This is already known, although scenarios related to the war and its impact on the global economy may yet vary.

“Getting to” the full-blown crisis will be preceded by the following 5 major processes:

1. Stagflation. The current high inflation is largely due to measures taken by governments and central banks during the COVID-19 era: on the one hand, whole branches of the economy were brought to a standstill, i.e. the production (supply) of goods was curtailed, and on the other hand, it was decided to support businesses financially by crediting their accounts with money “created” in the financial sector through so-called debt monetization – countries increased their debt, it was sold on the financial markets, or to central banks, and the funds from the sale of bonds were transferred to businesses and households. This meant the fastest increase in the amount of money in the financial system in many decades, which, once fairly normal economic life returned – meant more money and fewer goods on the market, resulting in inflation. These processes were compounded by problems with broken supply chains (some goods could not be produced, because there was a shortage of components. Sanctions imposed on Russia – additionally mean, e.g. an increase in energy commodity prices, compounding inflationary pressures. All this is not without an impact on the level of economic activity – in such uncertain times, entrepreneurs postpone investment, and consumers – after the first wave of purchases, stimulated by demand “postponed” during the pandemic, and then stimulated by the effect of “let’s buy it today, because it will be more expensive tomorrow” – will reduce their spending, saving “for a rainy day”.
2. Producer Price Inflation (PPI) – an indicator that precedes the CPI. Producer prices are growing rapidly and refuse to slow down. The latest PPI read-

ing for Poland is almost 25 percent year-on-year growth, and for the entire EU, the dynamics exceeds 30 percent y/y, while it has already exceeded even 37 percent y/y in the Eurozone in April 2022. This unfortunately means further “fuel” for consumer price increases in the months ahead. The prices of energy carriers in the autumn and winter months will be important. If their prices rise even higher, this will perpetuate inflationary pressures. It is also important to remember that until we see a clear drop in PPI, there is no use expecting a noticeable drop in consumer inflation.

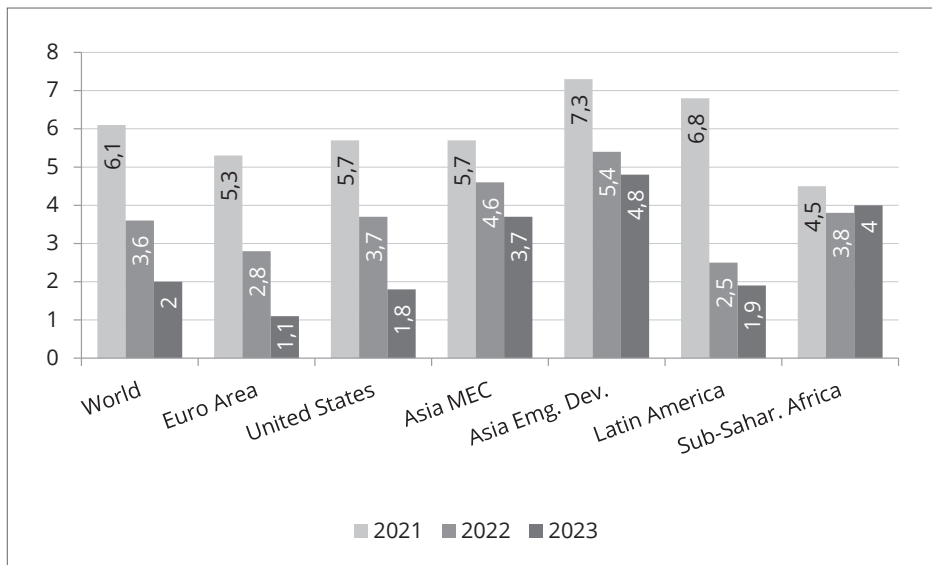
3. Foreign current account balance. The foreign account balance tells you whether you have a surplus – which, in simple terms, means that a country exports more than it imports – or a deficit, which is the opposite situation. The COVID-19 pandemic caused significant disruptions in this area, especially as a result of disrupted supply chains – the pressure towards imports increased significantly.
4. Twin deficits. The simultaneous existence of: a foreign trade deficit and a significant national budget deficit. In the pandemic, markets accepted much higher deficits, knowing that they were a response to extraordinary circumstances. The combined occurrence of a current account deficit of more than 5 percent and a budget deficit of similar magnitude (or higher if, for example, winter brings a gas “turn-off” for Europe, triggering a recession) would mean strong downward pressure on currencies.

In such a situation, if the country’s currency continues to remain weak after the government and central bank apply currency sales (from foreign exchange reserves), the central bank would be forced to raise interest rates even more sharply than currently assumed to defend the currency.

5. Public debt service costs. Financial markets are able to “forgive” quite a lot when it comes to the amount of the deficit under extraordinary circumstances. However, it is important to remember that high deficits are deposited in the form of growing debt. During the pandemic period, when both inflation and interest rates were low, there was no increase in the cost of servicing this debt – that is, interest on the debt was stable. Nevertheless, when inflation began to rise and bond yields rose sharply, it meant seriously rising debt service costs for public finances. Debt costs money, and the significant increase in the indebtedness of public finances in previous years will mean that the issue of the rising cost of servicing it will increasingly come up in public discourse.

As the International Monetary Fund points out, the global economy is currently struggling with high inflation and a slowdown. In May 2022, the growth forecast was lowered to 2.4 percent. Energy commodity prices have hit vulnerable low-income economies the hardest. According to forecasts, inflation for 2022 will be 18.7 percent for developed economies, and 22.7 percent in emerging and developing markets. As for the outlook for the global economy, growth will slow from an estimated 6.1 percent in 2021 to 3.6 percent in 2022 and 2.0 percent in 2023. Thus, this is 0.8 and 0.2 percentage points lower than predicted back in January. After 2023, growth is expected to drop to about 1.3 percent in the medium term. As can be seen, growth in 2023 will be visible in the sub-Saharan African region and in emerging and developing Asian economies [IMF April 2022] – Chart 1.

Chart 1. Growth projections by region (percent change)



Source: author’s own work or [IMF, April 2022].

According to IMF analysts, the war in Ukraine has aggravated two policy trade-offs – between fighting inflation and protecting the recovery, and between supporting the vulnerable and rebuilding fiscal buffers. The war will reduce economic growth for 143 economies accounting for 86 percent of global GDP. At the same time, it was stressed that the current outlook is highly uncertain, as it depends on the developing geopolitical situation. The reduction in growth for the United States is the most notable. The growth rate will be 3.7 percent in

2022 and 1.8 percent in 2023. According to the forecast, similar declines will be seen in Europe. The forecast for China, according to which the growth will be 4.4 percent in 2022, already reaching 5.1 percent in 2023, is noteworthy. For Russia, the index is expected to be -8.5 percent in 2022 and -8.5 percent in 2023: -2.3 percent [IMF April 2022]. The level of growth in the global economy will also be affected by the course of the COVID-19 pandemic in Q4 2022 and 2023, and its impact on the degree of disruption to supply chains. The pandemic has also resulted in a significant increase in corporate debt. According to the Bank for International Settlements, China's total debt last year already exceeded 250 percent of GDP, and according to other sources: it is already as high as 270 percent. 2/3 of that is corporate debt. Only a few countries in the world have a larger scale of corporate debt. According to the World Bank, these are: Cyprus and Hong Kong at about 200 percent of GDP each, the U. S. at 192 percent, Switzerland at 175 percent, Denmark at 165 percent, Japan at 162 percent and the very China – at 156 percent [IMF, UNCTAD 2022].

The danger of another major military conflict in the Middle East (Iran–Israel) in 2022/2023 and in Asia (China–Taiwan) should also be taken into account when forecasting the height of the recession. If any of these conflicts erupt, then any estimates should be lowered even further, and the economic crisis will get much worse.

4. Practical aspects of the transmission of economic shocks in the context of the coming crisis – an empirical analysis

Economic crises are the result of the transfer of negative economic impulses (crisis impulses) between countries. According to economic theory, crisis phase is characterized by rising unemployment and declining production, employment, investment, demand and prices.

Taking into account economic theory on the formation of economic prosperity, the empirical analysis and the study conducted adopted the following factors – the basic determinants of the crisis:

1) *Wars and political events [WPE]*

Undoubtedly, this factor plays an important role in the emergence of the crisis – as has already been partially written about in Section 3. Its importance and strength determine the direction and intensity of the crisis, as well as its type.

The war in Ukraine has caused grain supply shortages. Sanctions on Russia lead to the energy crisis. And all of this leads to a commodity crisis and the formation of scarcity economies.

2) *International Movement of People [IMP]*

International population flow is a less significant factor affecting the business cycle. They are not able to cause an economic crisis, because the outflow of unemployed people during a crisis mitigates the effects of a recession. This factor will not be considered in further analysis.

3) *International Movement of Goods [IMG]*

One of the most important factors contributing to the transmission of economic and crisis impulses is the flow of goods. When country 1's economy is in recession and international economic prosperity is also in recession, the decline in its domestic demand is not compensated for by an increase in exports. The consequence will be a deepening recession. If the crisis impulse comes out of a country or a group of countries with a serious share of world trade in goods, there will not be enough room for expansion in country 1, the income of exporters in country 2 will fall, which will negatively affect the condition of the entire global economy, which will reduce demand for imported goods including those from country 1. If it is assumed that the change in exports was caused by a change in the economic situation in country 2, then we get a mechanism for transferring economic impulses from 2 to 1, through the foreign trade channel. A measure of the sensitivity of country 1's income to these impulses is the elasticity of country 1's GDP to that of foreign countries. Meaning: $E_Y = E_E \cdot m \frac{E}{Y}$ where,

E_E – income elasticity of the country's 1 exports

m – foreign trade multiplier

$\frac{E}{Y}$ – share of exports in national income

Thus, the economy of country 1 is the more susceptible to the impact of the economic situation impulses of the environment, the greater the income elasticity of its exports, the greater the value of the foreign trade multiplier and the greater the share of exports in national income. Therefore, a large economic body that has fallen into recession – country 2 – reduces imports and lowers the price of export goods going to country 1. This has the effect of reducing their income,

which reduces the country's 2 imports. Country 2 in crisis – lowers prices of its exports. As a result, the destination country's imports are increasing which entails changes in the foreign trade balance. There is a drop in prices on the domestic market, and in addition, interest rates may rise to reduce consumption, resulting in an economic recession. The greater the share of country 2 in economic turnover, the greater will be the crisis impulse transferred by foreign trade.

4) *International direct capital flows [IDCF]*

The transfer of corporate profits is primarily related to foreign direct investment. These transfers will be greater when the country from which these investments originate is in recession and the destination country is booming. They are the smallest when the country receiving the investment is in recession and the country exporting the investment is booming. In a global recession involving major economies, the crisis impulse may spill over to countries where foreign direct investment was created through the corporate profit transfer channel [Piech, 2012: 56]. An analysis of the causal relationship in the Granger sense between real GDP growth and BIZ inflows was carried out when analyzing this factor. The general form of Granger's [Granger, 1969] definition of causality is formulated as follows: let generally $F(Y|X)$ denote the conditional distribution of Y at a given X , let W_t represent all information in the universe at time t . If for every positive k there is a relation: $F(Y_{t+k}|W_t) = F(Y_{t+k}|W_t \setminus X_t)$, where $W_t \setminus X_t$ stands for all information in the universe except that contained in X_t , then X_t is not the cause of Y_t . Otherwise, X_t is the cause of Y_t in the Granger sense [Osińska, 2008: 39–41]. In other words, the variable X_t is a cause in the Granger sense of the variable Y_t if the inclusion of lagged values of the variable X_t in the explanatory model of Y_t makes it possible to obtain a better description of the variable Y_t . On the other hand, referring to forecasting ability, this means that X_t is the cause of Y_t when we are better able to predict future values of Y_t using the entire available set of information than using the set of information excluding X_t [Folfas, 2014: 655].

5) *Price changes in the international market [PC]*

The price level is an important factor that can cause crises to be transmitted and may even be its source. If the current crisis is threatened, an increase in energy commodity prices could cause significant difficulties in the real sphere of many countries and complications in the functioning of the global economy.

The analysis assumes that the crisis impulse from the country in which the crisis occurs [2] to the target country to which the crisis impulse will be transferred [1] will be stronger the greater the degree of capital movement link between [1] and [2]. Moreover, it was assumed that in a crisis situation, the crisis impulse will be stronger the greater the share of exports [2] in the realization of production [1]. In addition, it was assumed that between [1] and [2], the transmission of crisis impulses to underdeveloped and highly developed countries is carried out using the relationship: highly developed country – underdeveloped country – decrease in demand in [2] for goods [1] – decrease in exports [1]; highly developed country – highly developed country – [2] has a pro-export policy and reduces imports, in [1] decrease in exports.

The analysis and study adopted statistics for the period 2019-Q2 2022 and forecast for 2023. The initial time period adopted was dictated by the onset of the COVID-19 pandemic. The analysis and study included: United States of America [USA], Euro Area [EA], Middle East and Central Asia [MECA], Emerging and Developing Asia [EDA], Latin America [LA] and the Caribbean and Sub-Saharan Africa [CSSA].

The key issue in the study – after analyzing the determinants of the crisis 1–5 – was the correlation coefficients determining the level of linear dependence between random variables. Pearson’s linear correlation coefficient was used for this purpose.

$$r(x,y) = \text{cov}(x,y) / \sigma_x \cdot \sigma_y$$

$$\text{cov}(x,y) = E(x \cdot y) - (E(x) \cdot E(y))$$

where:

- $r(x, y)$ – the correlation coefficient between the variables x and y ,
- $\text{cov}(x, y)$ – covariance between the variables x and y ,
- σ – standard deviation,
- E – expected value.

It leads to the classification of correlations into weak and strong. In the case of negative correlation, a weak relationship is said to exist when the final result of the equation is between -0.1 and -0.5. Values below -0.5 indicate a strong negative correlation. The same applies to a positive correlation – values between 0.1 and 0.5 define a weak correlation, and a strong one above 0.5.

- the coefficient r takes values in the range $[-1,1]$,
- the closer the value is to 1, the stronger and positive the relationship (if x increases, then y increases),

- the closer the value is to -1, the stronger and negative the relationship (if x increases, then y decreases),
- r = 0 means there is no linear relationship between the variables.

The study assumed the following correlations:

- r > 0 positive correlation – when the value of x increases, so does y,
- r = 0 no correlation – when x increases, then y sometimes increases and sometimes decreases,
- r < 0 negative correlation – when x increases, then y decreases.

Correlation strength for |r|:

- 0.1 < 0 <= 0.1 – weak correlation,
- 0.3 < 0 <= 0.5 – average correlation,
- 0.5 < 0 <= 0.7 – high correlation,
- 0.7 < 0 <= 0.9 – very high correlation,
- -1 or 1 – full correlation.

Let x and y be random variables with discrete distributions x_i, y_i , denote the values of the random samples or variables ($i = 1, 2, \dots, n$), while \bar{x}, \bar{y} – mean values from these samples, then: $\bar{X} = \frac{1}{n} \sum_{i=1}^n x_i, \bar{Y} = \frac{1}{n} \sum_{i=1}^n y_i$, then the estimator of the linear

correlation coefficient is defined as follows $r_{x,y} = \frac{\sum_{i=1}^n (x_i - \bar{x})(y_i - \bar{y})}{\sqrt{\sum_{i=1}^n (x_i - \bar{x})^2 \sum_{i=1}^n (y_i - \bar{y})^2}}; r_{x,y} \in [-1, 1]$.

In general, the linear correlation coefficient of two variables is the quotient of the covariance and the product of the standard deviations of these variables – in particular, for random variables with discrete distributions, it has the form:

$$r_{X,Y} = \frac{cov(X,Y)}{\sigma_X \sigma_Y} = \frac{[\sum_{i=1}^n \sum_{j=1}^m P(X = x_i, Y = y_j) x_i y_j] - \bar{X} \bar{Y}}{\sqrt{[\sum_{i=1}^n P(X = x_i) X_i^2] - (\bar{X})^2} \sqrt{[\sum_{i=1}^m P(Y = y_i) Y_i^2] - (\bar{Y})^2}}$$

The value of the correlation coefficient is in the closed range [-1, 1]. The greater its absolute value, the stronger the linear relationship between the variables. $r_{x,y} = 0$ denotes no linear relationship between features $r_{x,y} = 1$, means exact positive linear relationship between features, while $r_{x,y} = -1$ means exact negative linear relationship between features, i.e. if the variable x increases, y decreases and vice versa.

Table 1. Resulting matrix of correlation of major world economic regions and crisis factors as of April 2022

Correlation of regions: 1-2, 2-1	Factor	r
USA-EA	WPE,IMP,IMG,IDCF,PC	0;0;0.1;0.5;0.2
USA-MECA	WPE,IMP,IMG,IDCF,PC	0.7;0;0.5;0.3;0.3
USA-EDA	WPE,IMP,IMG,IDCF,PC	0.7;0;0.7;0.7;0.5
USA-LA	WPE,IMP,IMG,IDCF,PC	0.1;0;0.1;0.2;0.1
USA-CSSA	WPE,IMP,IMG,IDCF,PC	0;0;0;0;0
EA-USA	WPE,IMP,IMG,IDCF,PC	0;0.1;0.1;0.1;0.1
MECA-USA	WPE,IMP,IMG,IDCF,PC	0.5;0.3;0.1;0.1;0
EDA-USA	WPE,IMP,IMG,IDCF,PC	1;0.1;0.2;0.1;0.1
LA-USA	WPE,IMP,IMG,IDCF,PC	0;0.5;0.1;0.1;0.1
CSSA-USA	WPE,IMP,IMG,IDCF,PC	0;0;0;0;0
EA-MECA	WPE,IMP,IMG,IDCF,PC	0;0.1;0.4;0.3;0.2
EA-EDA	WPE,IMP,IMG,IDCF,PC	0;0.1;0.3;0.3;0.3
EA-LA	WPE,IMP,IMG,IDCF,PC	0;0;0;0;0
EA-CSSA	WPE,IMP,IMG,IDCF,PC	0;0;0;0;0
MECA-EA	WPE,IMP,IMG,IDCF,PC	1;0.5;0.9;0.9;0.9
EDA-EA	WPE,IMP,IMG,IDCF,PC	1;0.4;0.9;0.8;0.8
LA-EA	WPE,IMP,IMG,IDCF,PC	0;0;0;0;0
CSSA-EA	WPE,IMP,IMG,IDCF,PC	0;0;0;0;0
MECA-EDA	WPE,IMP,IMG,IDCF,PC	1;0.2;0.9;0.9;0.9
MECA-LA	WPE,IMP,IMG,IDCF,PC	0;0;0;0;0
MECA-CSSA	WPE,IMP,IMG,IDCF,PC	0;0;0;0;0
EDA-MECA	WPE,IMP,IMG,IDCF,PC	1;0.2;0.9;0.9;0.9
LA-MECA	WPE,IMP,IMG,IDCF,PC	0;0;0;0;0
CSSA-MECA	WPE,IMP,IMG,IDCF,PC	0;0;0;0;0
EDA-LA	WPE,IMP,IMG,IDCF,PC	0;0.1;0.1;0.1;0.1
EDA-CSSA	WPE,IMP,IMG,IDCF,PC	0;0;0;0;0
LA-EDA	WPE,IMP,IMG,IDCF,PC	0;0.1;0.1;0.1;0.1
CSSA-EDA	WPE,IMP,IMG,IDCF,PC	0;0;0;0;0
LA-CSSA	WPE,IMP,IMG,IDCF,PC	0;0;0;0;0
CSSA-LA	WPE,IMP,IMG,IDCF,PC	0;0;0;0;0

Source: author's own work, based on calculations for: WPE, IMP, IMG, IDCF, PC.

5. Conclusions

The current situation in the global economy, determined mainly by the economic consequences of the COVID-19 pandemic and the war in Ukraine, is causing a progressive decline in the global economy and great uncertainty. It seems that the world is facing a new economic crisis, and the question that needs to be asked now is not so much about the fact of the crisis but about its intensity and scale. Hence, the aim of the study was to analyze the main economic areas of the global economy in terms of the transferability of the crisis in relation to the current global economic situation. The analysis conducted showed:

1. The progressive scale of the decline in basic macroeconomic indicators and especially their forecasts point to a further development of the global downturn.
2. The end of 2022 and the beginning of 2023 will be marked by a crisis in energy (especially in Europe) as well as raw materials and food.
3. The dismantling of the current world order and harmony, still led by Russia, will proceed.
4. The war in Ukraine will not end soon and a new global conflict in the Middle East (Iran-Israel) or Asia (China-Taiwan) is likely on the horizon. At the same time, the danger of turning the war in Ukraine into a global conflict will persist.
5. As a result of the perpetuation of broken supply chains – there will be periodic shortages of many goods, mainly in the high-tech field, which to some extent will make the global economy – an economy of shortages.
6. As a result of rising inflation, societies will become impoverished.
7. The channels of transmission of the crisis in the form of: the commodity market, the movement of money and changes in interest rates have been confirmed.
8. At this point, it seems likely that the “arrival” of a full-blown crisis will be preceded by 5 major processes: stagflation, producer price inflation, current account balance, twin deficits and the cost of servicing public debt.
9. Of the 5 indicators adopted to characterize the downturn – in view of the risk of a crisis today – the strongest will be wars and political events; the international flow of goods; and the international flow of direct capital. The weakest impact will come from the international movement of people and changes in international market prices.

10. For a group of countries (Table 1): USA–CSSA, CSSA–USA, EA–LA, EA–CSSA, LA–EA, CSSA–EA, MECA–LA, MECA–CSSA, LA–MECA, CSSA–MECA, EDA–CSSA, CSSA–EDA, LA–CSSA, CSSA–LA, meaning a positive domestic shock transmitted to the economic partner, among the countries studied, the analysis is carried out based on annual data of GDP values as a measure of economic activity.
11. CSSA (Table 1) remains the safest economic area and also the most neutral one in view of the current global economic and political situation.
12. In the WPE (Table 1), there is a maximum (full) correlation of 1 for: EDA–USA, MECA–EA, EDA–EA, MECA–EDA and EDA–MECA. These are currently the most dangerous and crisis-prone areas, with potential for transferring crises between them. It is facilitated by territorial cohesion and the geopolitical situation between countries in these economic regions. Relatively high correlations can also be observed in these areas between the analyzed factors: IMP, IMG, IDCF and PC. The risk of transferring a crisis resulting from war, between the areas mentioned, is the highest here. There is already an armed conflict in Ukraine, the scale of further development of which is unpredictable. Due to the extent of global economic interdependence, the effects of the war will be felt by most European Union countries. The war in Ukraine means the challenge of an unprecedented number of refugees, a further increase in inflation and a deterioration in the structure of public debt. The prices of food and energy will increase the most. In addition to disrupted food supply chains, one must also consider the sanction-induced reduction in fertilizer exports, which will increase the cost of food production. Globally, the war is reducing global food security, as Russia and Ukraine rank 1st and 5th respectively in global wheat exports, and are major suppliers of other agricultural products. The outbreak of war and fear of supply disruption resulted in a rise in the price of grain and other agricultural commodities on world markets. The war against Ukraine has also affected the prices of energy commodities, especially oil. Further changes in energy commodity prices will depend on sanctions imposed on Russia and Belarus, as well as retaliatory Russian actions. In contrast, fuel price increases will be felt most strongly by consumers in Luxembourg, Slovenia and Hungary. In January, the rise in fuel prices indirectly added 3.2 percentage points to inflation in Luxembourg, 2.0 percentage points in Slovenia and 1.5 percentage points in Hungary, accounting for 81 percent, 73 percent and 27 percent of inflation in those countries, respectively. The

current war is leading to the largest refugee crisis in Europe after World War 2. During the first four weeks since the beginning of the aggression alone, 3.7 million people left Ukraine, most of whom came to Poland. Another 6.5 million had to move inside Ukraine. The influx of refugees could be a huge burden on neighboring countries, including Poland. Finally, it is important to remember that the threat of a new conflict is as real as possible just from the areas: MECA and EDA.

13. Other correlations in terms of (Table 1): USA–EA, USA–LA, EA–USA, LA–USA, LA–EDA, EDA–LA remain at weak or average levels. This is influenced by geographic distance and the lack of strong economic and political ties.
14. Further research should focus on the scale and impact of the coming crisis and the means to mitigate it.

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